

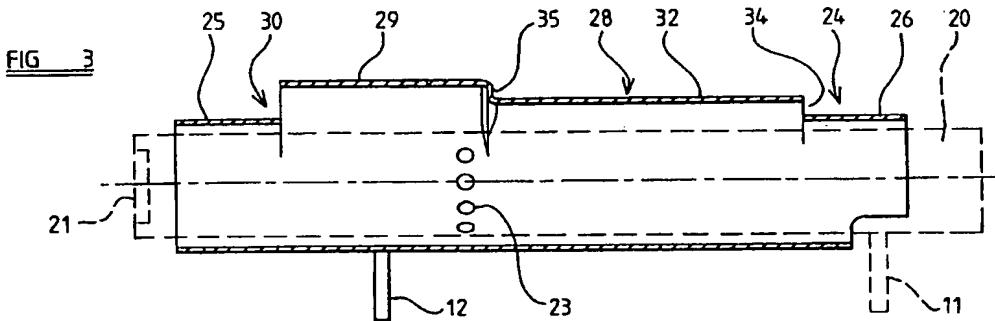
# UK Patent Application GB 2 406 312 A

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(54) Abstract Title: Gas deflector

(57) A gas deflector 24 is disclosed for use with a cylindrical gas generator 20, said deflector comprising a generally tubular housing to accommodate the gas generator. The housing has two terminal portions 25,26 of generally circular cross-section and has an intermediate region provided with an outwardly extending formation 28. The outwardly extending formation defines, at either end thereof, an opening 34 (see also figure 2) through which gas may flow in the direction substantially parallel to the axis of the housing. The openings 34 may be of different sizes so as to provide different gas flows to separate internal air bag chambers (7,8 figure 1). The outer surface of the outwardly extending formation 28 may be stepped 35 or tapered between the two openings.



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## 5 DESCRIPTION OF INVENTION

**"IMPROVEMENTS IN OR RELATING TO A GAS DEFLECTOR"**

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**THE PRESENT INVENTION** relates to a gas deflector, and more particularly relates to a gas deflector for use with a gas generator configured to supply gas to inflate an air-bag, such as an air-bag provided in a motor vehicle to give protection to a vehicle occupant in the event that an accident should occur.

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Many gas generators utilised as inflators for air-bags are of a generally cylindrical form. Typically such a gas generator is provided with a plurality of apertures formed in the outer wall of the gas generator, and on actuation of the gas generator, gas flows in a radially outward direction through these apertures.

20 However, in many cases, it is most desirable for gas from the gas generator to flow into the air-bag with a flow direction which is substantially parallel to the axis of the cylindrical gas generator. Consequently there is a requirement for a gas deflector which will deflect the radially outwardly flow of gas emanating from the gas generator and convert that flow of gas into a gas flow which is 25 substantially parallel with the axis of the gas generator. In some cases, the requirement is more complicated, since the flow of gas flowing in one direction is to be greater than the flow of gas flowing in the opposite direction.

The present invention seeks to provide an improved gas deflector.

According to the present invention, there is provided a gas deflector for use with a cylindrical gas generator, the gas deflector comprising a generally tubular housing, to accommodate the cylindrical gas generator, the housing having two terminal portions of generally circular cross-section and having an intermediate region provided with an outwardly extending formation, the outwardly extending formation defining, at either end thereof, an opening through which gas may flow in a direction substantially parallel to the axis of the housing.

Preferably, the gas deflector is provided with a mounting stud.

Advantageously, part of one end region of the housing is cutaway to receive a mounting stud on a gas generator.

Conveniently, one of the gas outlet openings defined by the outwardly extending formation is of a greater cross-sectional area than the other of the openings formed by the formation.

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Preferably the formation is a formation which extends radially outwardly in a bridge-like manner.

Advantageously, the outwardly extending formation has a first portion and a second portion, the first portion having a greater radial extent than the second portion and thus defining the aperture of greater cross-sectional area.

Conveniently, the formation has an inclined outer wall, thus being of substantially tapering form, one end of the formation defining the said

relatively large cross-section aperture and the other end defining the relatively small cross-section aperture.

Another aspect of the present invention provides a gas deflector as  
5 defined above in combination with a cylindrical gas generator received within the gas deflector, the cylindrical gas generator having at least one gas outlet aperture formed in the side wall thereof in a region aligned with the said formation, the gas generator having an external diameter substantially equal to the internal diameter of the terminal regions of the deflector.

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Preferably, the gas generator is provided with a mounting stud, the mounting stud being received within said cut-away region of the gas deflector housing.

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Another aspect of the present invention provides an air-bag incorporating a gas deflector and gas generator combination as defined above, wherein the air-bag defines two internal chambers, one of said openings communicating with one of the chambers and the other of the openings communicating with the other of the chambers.

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Preferably, part of the air-bag is clamped to the exterior of the gas generator so that the chambers are substantially sealed from each other.

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In order that the invention may be more readily understood, and so that further features thereof may be appreciated, an embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic view of a side air-bag for use with a motor vehicle illustrating a gas generator (in phantom) and gas deflector;

FIGURE 2 is a perspective view of the gas generator and gas deflector assembly of Figure 1;

FIGURE 3 is a sectional view through the gas deflector of the assembly of Figure 2; and

FIGURE 4 is a side view of the gas deflector of the assembly of Figure 2.

Referring initially to Figure 1 of the accompanying drawings, a side air-bag 1 is illustrated. The side air-bag 1 is intended to be mounted in position in the back rest of a vehicle seat or in the side wall of a motor vehicle adjacent to the vehicle seat so that the air-bag, when inflated, is located between the seat occupant and a side part of the motor vehicle. The air-bag is formed from two super-imposed layers of fabric 2,3 which, in the described embodiment, are interconnected by a notional fold or hinge line 4. Each of the layers of fabric is of the same shape and size, and the layers are folded about the notional hinge line 4 and are interconnected by means of a seam 5. The seam 5 extends around the periphery of the super-imposed layers 3,4 and includes a re-entrant seam portion 6 which extends substantially transversally across the air-bag, dividing the air-bag into an upper chamber 7 and a lower chamber 8. The lower chamber 8 is provided with an inlet opening or throat 9 through which an assembly 10 which includes a gas generator and a gas deflector (as will be described in greater detail below), may be introduced to the interior of the air-bag. The assembly 10 is provided with two protruding mounting studs 11,12 which extend through respective apertures provided in the notional fold

line 4 to enable the assembly 10 together with the complete air-bag 1 to be mounted in position in the motor vehicle.

The re-entrant portion 6 of the peripheral seam 5 is provided with an  
5 aperture 13 and a clamp may be introduced through the aperture 13, the clamp being of ring-like form, the clamp being configured to bring the innermost end of the re-entrant portion 6 of the seam 5 into firm engagement with the exterior of the assembly 10 thus effectively sealing the upper chamber 7 from the lower chamber 8.

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It is to be observed that the throat 9 is provided with a closure flap 14 which itself incorporates an aperture 15. The closure flap 14 may be folded closed after the assembly 10 has been inserted into the air-bag, with the aperture 15 engaging the mounting stud 11.

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As will be described hereinafter, the assembly 10 is such that, on actuation of the gas generator, gas will be directed substantially upwardly, generally as indicated by the arrow 16, into the upper chamber 7, and gas will also be directed downwardly, generally as indicated by the arrow 17 into the  
20 lower chamber 8.

When the air-bag 1 is mounted in position and inflated, the lower chamber 8 may be located adjacent the pelvis of the seat occupant and the upper chamber 7 may be located adjacent the thorax of the seat occupant. The  
25 upper chamber 7 may be inflated to a pressure which is greater than the pressure to which the lower chamber 8 is inflated.

Turning now to Figures 2 and 4, the assembly 10 includes a cylindrical gas generator 20. One end of the cylindrical gas generator 20 is provided with a plug 21, which can receive an appropriate connector so that a signal may be passed to the gas generator to actuate the gas generator in a manner which is  
5 well known.

The gas generator 20 is provided, at a point intermediate its two ends, with a plurality of gas outlet apertures 23 (which can be seen in phantom in Figure 3). The gas generator is also provided with one of the mounting studs  
10 11.

Associated with the gas generator is a gas deflector 24. The gas deflector 24 is of generally hollow cylindrical form and defines a generally tubular housing to accommodate the gas generator. The gas deflector 24 carries  
15 the other of the mounting studs, namely mounting stud 12. The gas deflector 24 has two opposed terminal regions 25,26 which are of substantially circular cross-section, the internal diameter of the terminal regions 25,26 being only very slightly greater than the external diameter of the cylindrical gas generator 20. One terminal region 26 is provided, at the free end thereof, with  
20 a "cutaway" region 27, the cutaway region 27 being positioned so that when the gas generator 20 has been inserted into the gas deflector 24 the mounting stud 11 carried by the gas generator will be received within the cutaway region 27. Because the stud 11 is received within the cutaway 27, the gas generator cannot rotate, about its longitudinal axis, relative to the gas deflector 24.

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Intermediate the two opposed end regions 25,26, the gas deflector 24 is provided with a formation 28 which has a greater outward radial extent than the terminal regions 25,26. In the described embodiment, the formation 28 has a first outwardly directed region 29, located adjacent the first end region 25, and

separated therefrom by means of a slit 30. The effect, consequently, is that at the end of the outwardly extending region 29 adjacent the end region 25 an opening or aperture 31 is formed as can be seen most clearly in Figure 2. The opening 31 is directed towards the end of the gas generator 20 which is 5 provided with the described plug 21.

Thus, as viewed from the end of the assembly 10, the outwardly directed formation 29 visually resembles a bridge, with the opening 31 being defined beneath the bridge constituted by the outwardly directed region 29 and the 10 terminal region 25.

The second part of the formation 28 is another outwardly directed region, this being an outwardly directed region 32 which is separated from the adjacent terminal region 26 by means of a slit 33. The region 32 extends 15 outwardly, but not too such an extent as the region 29. An opening or aperture 34 (see Figure 3) is thus created, and the opening 34 is such that if the assembly is viewed from the other end, that is to say the end remote from the plug 21, again the outwardly extending portion 32 appears as a bridge, the bridge extending over the opening 34.

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As can be seen most clearly from Figure 3, the outwardly directed regions 29, 32 are, in this embodiment, interconnected by a step formation 35. However, as an alternative, it is also envisaged that the formation 28 could have an inclined outer wall, thus being of substantially tapering form between the 25 two regions 29, 32. As another possible alternative, it is also envisaged that the formation 28 could have a straight wall substantially parallel to the outer wall of the gas generator, in which case, the two openings 31, 34 will be substantially identical to one another.

It is thus to be understood that on actuation of the gas generator 20, gas will flow radially outwardly through the apertures 23 into the gas deflector 24. Gas will then flow axially of the assembly 10, flowing parallel to the central axis of the gas deflector housing. A relatively large flow of gas will emerge through the opening 31, as this opening is relatively large, that flow of gas flowing in the direction illustrated by the arrow 16 into the upper chamber 7. A smaller flow of gas will flow through the opening 34 in the direction indicated by the arrow 17 into the lower chamber 8.

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Whilst, in the described embodiments, the openings 31 and 34 have been illustrated in the form of a generally "crescent" shape, in alternative embodiments of the invention, the openings may be triangular or even rectangular, depending upon the configuration of the outwardly directed regions 15 29, 32. The use of convex or concave forms for the openings 31 and 34 is also possible.

A gas deflector as described above may be fabricated by taking the generally cylindrical "blank", cutting two slits into the exterior of the blank, 20 each slit extending part way round the circumference of the blank, and inserting a deforming and shaping tool into the blank, then driving the shaping and deforming tool radially outwardly between the slits, the shaping and deforming tool being configured to deform the exterior wall of the blank to produce the formation 28 as described above. Alternatively the deflector 24 can be 25 manufactured by taking a sheet which is cut to the right length, providing the sheet with appropriate slits, subsequently pressing the region of the sheet between the slits to form the structure 28 as described above, the sheet subsequently being rolled to form a tube form, with the then adjacent edges of the sheet being secured together, for example by welding.

A further alternative technique would be to produce a tubular blank, to cut an appropriate opening in the side wall of the blank and to weld a pre-formed structure, equivalent to the structure 28, into the opening formed in  
5 the wall of the blank.

In the present Specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

10 The features disclosed in the foregoing description, or the following Claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse  
15 forms thereof.

## CLAIMS:

- 5    1. A gas deflector for use with a cylindrical gas generator, the gas deflector comprising a generally tubular housing, to accommodate the cylindrical gas generator, the housing having two terminal portions of generally circular cross-section and having an intermediate region provided with an outwardly extending formation, the outwardly extending formation defining, at either end  
10 thereof, an opening through which gas may flow in a direction substantially parallel to the axis of the housing.
2. A gas deflector according to Claim 1 wherein the gas deflector is provided with a mounting stud.
- 15    3. A gas deflector according to Claim 1 or Claim 2 wherein part of one end region of the housing is cutaway to receive a mounting stud on a gas generator.
- 20    4. A gas deflector according to any one of the preceding Claims wherein one of the gas outlet openings defined by the outwardly extending formation is of a greater cross-sectional area than the other of the openings formed by the formation.
- 25    5. A gas deflector according to any one of the preceding Claims wherein the formation is a formation which extends radially outwardly in a bridge-like manner.
6. A gas generator according to Claim 4 wherein the outwardly extending formation has a first portion and a section portion, the first portion having a

greater radial extent than the second portion and thus defining the aperture of greater cross-sectional area.

7. A gas generator according to any one of Claims 4 to 6 wherein the  
5 formation has an inclined outer wall, thus being of substantially tapering form,  
one end of the formation defining the said relatively large cross-section  
aperture and the other end defining the relatively small cross-section aperture.

8. A gas deflector according to any one of the preceding Claims in  
10 combination with a cylindrical gas generator received within the gas deflector,  
the cylindrical gas generator having at least one gas outlet aperture formed in  
the side wall thereof in a region aligned with the said formation, the gas  
generator having an external diameter substantially equal to the internal  
diameter of the terminal regions of the deflector.

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9. A gas deflector and gas generator combination according to Claim 8 as  
dependent upon Claim 3 in which the gas generator is provided with a  
mounting stud, the mounting stud being received within said cut-away region of  
the gas deflector housing.

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10. An air-bag incorporating a gas deflector and gas generator combination  
according to Claims 8 or 9 wherein the air-bag defines two internal chambers,  
one of said openings communicating with one of the chambers and the other of  
the openings communicating with the other of the chambers.

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11. An air-bag according to Claim 10 wherein part of the air-bag is clamped  
to the exterior of the gas generator so that the chambers are substantially sealed  
from each other.

12. A gas deflector substantially as herein described with reference to and as shown in the accompanying drawings.

5 13. A gas deflector and gas generator combination substantially as herein described with reference to and as shown in the accompanying drawings.

14. An air-bag substantially as herein described with reference to and as shown in the accompanying drawings.

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15. Any novel feature or combination of features disclosed herein.



Application No: GB 0322519.0  
Claims searched: 1 to 14

Examiner: Peter Gardiner  
Date of search: 10 December 2003

## Patents Act 1977 : Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1,2,5,8	WO 03/059690 A2 (TAKATA-PETRI) see apertures 14a and 14b in figure 3
X	1,2,5,8	EP 0790154 A1 (TRW) see figures 8 and 9 in particular
X	1,8	JP 09-249090 (TOYODA) see deflector 18 in particular
A		DE 20310575 U1 (TAKATA-PETRI) see figures 1 and 3 in particular
A		DE 10211232 A1 (AUTOLIV) see whole document
A		US 5547215 (TAGUCHI) see figures 13 and 14 in particular

### Categories:

X Document indicating lack of novelty or inventive step	A Document indicating technological background and/or state of the art.
Y Document indicating lack of inventive step if combined with one or more other documents of same category.	P Document published on or after the declared priority date but before the filing date of this invention.
& Member of the same patent family	E Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>V</sup>:

B7B

Worldwide search of patent documents classified in the following areas of the IPC<sup>7</sup>:

B60R

The following online and other databases have been used in the preparation of this search report:

WPI, EPODOC, JAPIO